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ABSTRACT

Questions are examined concerning the effectiveness and efficiency of the Basic Educational Opportunity Grant financial aid program in providing equality of choice between public and private institutions. The research question is: given the initial preferences for either public or private institutions, what is the probability that a student will matriculate at a private college or university? Data were obtained on 115,325 college freshmen by merging American College Testing program and Educational Testing Service files with the American Council on Education survey of college freshmen matriculating in the fall of 1975. Institutional data from the Higher Education General Information Survey was also available for each student. Six institutional variables, 21 individual student characteristics, and 14 reasons why students decided to matriculate at a particular institution were analyzed. A prediction model and results of multiple regression analyses are discussed. (SW)

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The Impact of Financial Aid on Public/Private Postsecondary Education: Some Policy Implications

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This paper was presented at the Annual Meeting of the Association for the Study of Higher Education held at the Washington Hilton in Washington, D.C. April 18-19, 1979. This paper was reviewed by ASHE and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC collection of ASHE conference papers.

The Impact of Financial Aid on Public/Private Postsecondary Education: Some Policy Implications

A common bit of folklore is that public and private postsecondary institutions are in direct competition for students. Further, private institutions lament the fact that they are at a competitive disadvantage due to the "tuition gap," the difference between the stated tuitions of public and private institutions. However, this "tuition gap" argument should be labelled the "two-price market fallacy" due to the fact that students face a wide variety of "net prices" (i.e. stated tuition less student financial aid).

Federal policies have assisted institutions in the development of these differential pricing policies. Federal financial aid programs have primarily been targeted at the capital barriers confronting low income groups. Together with meritocratic scholarship programs, these federal programs have resulted in a proliferation of the net prices encountered by students from different income and ability levels. Further, these same federal programs, which were initially intended to overcome economic barriers to access, are increasingly being considered as a means of providing equality of choice among postsecondary institutions.

Questions remain, however, concerning the effectiveness and efficiency of these financial aid programs for providing equality of choice between public and private institutions. The purpose of this study is to examine some of these questions. Specifically, what is the additional cost of inducing one more student to enroll in a private rather than a public

institution? Given these estimates, what are the trade-offs between additional federal government expenditures and increases in the proportion of students enrolled in the private sector? For the purposes of this paper, these latter questions will be confined to the federal government's Basic Educational Opportunity Grant (BEOG) financial aid program, primarily due to the difficulties involved in estimating the costs to the taxpayer of other financial aid programs.

Student Public/Private Choice Behavior

This study assumes that the decision of a student to matriculate at a particular institution is the termination of a sequential choice process. The first decision in this process is the decision to attend or not attend a postsecondary institution. Once the future student has decided to go to colllege, he/she must decide to which institutions he/she will apply. (Hereafter, the institutions to which the student applies will be called the student's choice set.) Within each student's choice set, it is assumed that there is at least a partial ordering of the student's preferences, in which one institution is most preferred or his/her "first choice". Finally, the future student is confronted with a decision to matriculate to one institution from among those to which he/she has been admitted. Figure 1 displays these stages in the college student's choice process.

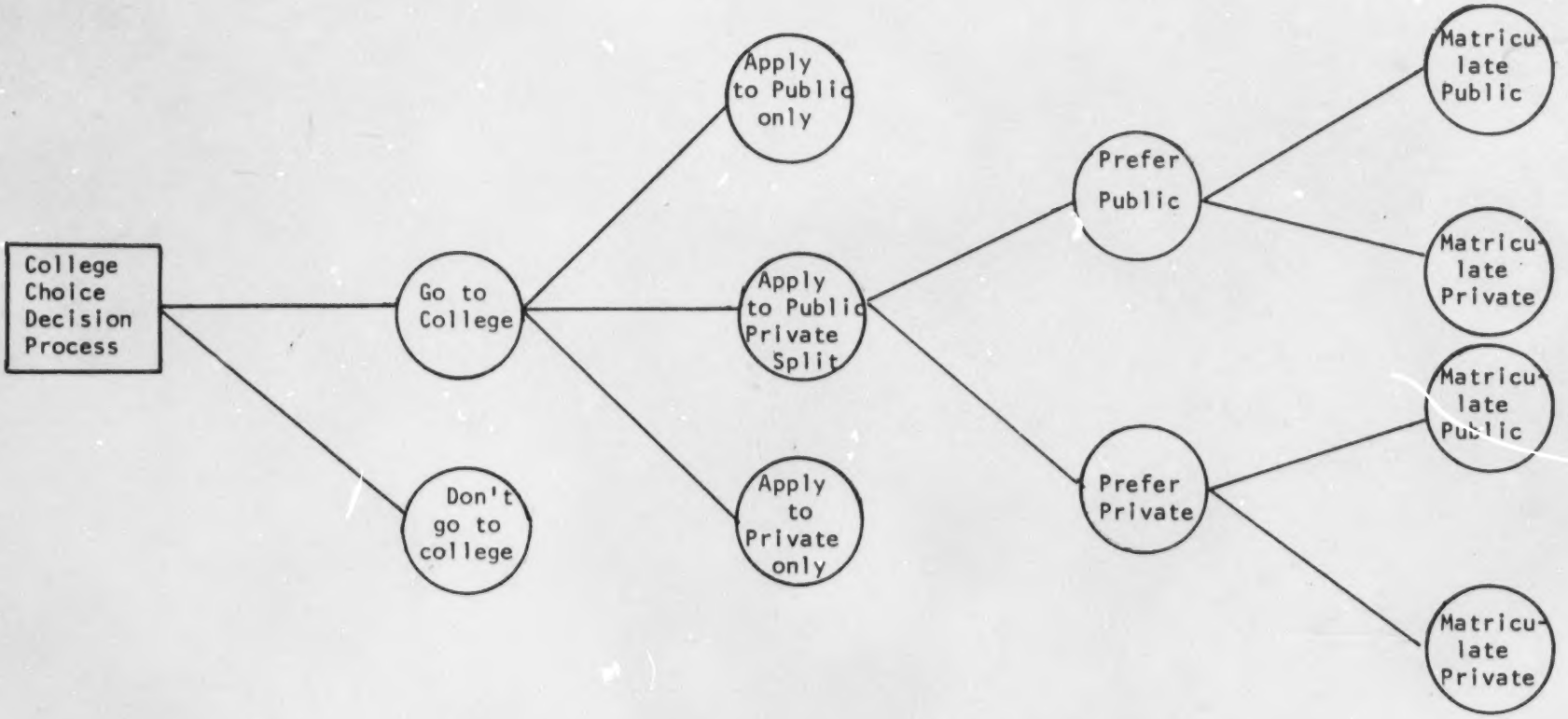
- Figure 1 Here -

The focus of this study is upon the last stage in this decision process. Further, the study is concerned with only those students who have at least one public and at least on private institution within their choice sets, as is indicated in Figure 1. The research question

Figure 1

Student College Choice

Decision Process



addressed is given the initial preferences for either public or private institutions, what is the probability that a student will matriculate at a private college or university?

(There are, of course, alternative ways of partitioning this complex decision process. For instance, Kohn Manski and Mundel, 1974, postulate that if an individual is not able to matriculate at his/her most preferred institution, then he/she will not go to college at all. These alternative formulations must also be investigated because the way in which these complex decisionsare partitioned may affect the overall understanding of the college choice process. See Luce, 1959. A critical constraint in partitioning such complex decisions is the practical question of the way in which the data are collected. This last issue will be discussed subsequently.)

Estimates of the final four probabilities in Figure 1 suggest a Markov model of private (and public) college enrollments. Such a model postulates that the vector of college Matriculants is related to the vector of initial student Preferences through a set of transition probabilities. The model for college matriculants is:

$$\text{Matriculants}_i = \text{Preferences}_i * T \qquad (1)$$

where i = the states (dimensions) of the Preferences and Matriculants vectors (there being only 2 in this case, i.e. public or private) and T represents the transition matrix, $T = [p_{ij}]$. Each p_{ij} is the probability that a student who inititally prefers institution type i (private) actually matriculates at institution type j (public). Table 1 presents the core transition matrix for this type of problem.

- Table 1 Here -

TABLE I

Fundamental Transition

Matrix

Initially Preferred	Matriculate At: Public Institution	Matriculate At: Private Institution	Total Preferring
Public Institution	P_{11}	P_{12}	$N_{1\cdot}$
Private Institution	P_{21}	P_{22}	$N_{2\cdot}$
Total Matriculating	$N_{\cdot 1}$	$N_{\cdot 2}$	$N_{\cdot\cdot}$

Examination of Table 1 provides insights into three ways to increase private college enrollments. First, an increase in the number of students who consider a public/private choice set would increase private enrollments, all else being equal. In the case of private institutions, enrollments from students with this type of choice set is equal to $(N._1 * P_{12}) + (N_2. * P_{22})$. Thus, any increase in the number of students with this choice set would result in increased private enrollments $(N._2)$. Although extremely important, this alternative would require an exploration of student decisions at the application stage, a task not undertaken in this study.

The remaining two methods of increasing private college matriculants involves manipulating either p_{12} or p_{22}. The standard Markov model assumes that the various transition probabilities p_{ij} are "stationary", i. e. stable over time. However, the objective of policies to provide equality of choice is to alter these transition probabilities until the proportion of private college matriculants $(N._2/N..)$ reaches a desired level. The question then arises, what are the additional costs associated with altering these transition probabilities?

Student Demand Functions

To answer this question, data drawn from a recently created, national longitudinal sample of 115,325 college freshment was examined.[1] This national data base was created by merging American College Testing program (ACT) and the Educational Testing Service (ETS) files with the American Council on Education (ACE) survey of college freshmen matriculating in the Fall of 1975. In addition, institutional data from the Higher Education General Information Survey (HEGIS) is also available for each student. This institutional data pertains not only to the institution of matriculation, but

to all institutions in the student's choice set as identified by the students when they were high school students in 1973-74 and 1974-75.

Using this data, it is possible to estimate most of the branches in Figure 1. Of the 115,325 students who had already made the decision to go to college, 38,389 (33 percent) applied to at least one public and one private institution. The remaining branches from this decision mode were estimated using a subsample of 6444 students of the original 38,389. The substantial deletion of cases were due to (1) control for whether or not the student was admitted to at least one public and one private institution (a lose of 16,564 cases), (2) control for consistency in the student's choice set (a lose of 14,327 cases), and (3) control for missing data (a lose of 1,054 cases).

It is critical to control for consistency in student choice sets due to the fact that financial aid data for each institution in the student's choice set was available only on the ACE portion of the student's record. Thus, in order to control for inaccuracies in the student's reconstruction of his/her choice set, the institutions identified by the student when he/she was a senior in high school had to match those institutions to which the student reported that he/she had been admitted. Further, it is not practical to check whether or not the student was admitted to the institutions that he/she indicated. However, there is little reason to believe that the student would be motivated to distort his/her report.

For these 6444 cases, 3466 (54 percent) initially preferred private institutions. Initial preferences were defined in terms of the first institution listed in the twelth grade portion of the student's records.

Although this method of operationalizing student preferences is somewhat less reliable, there does not appear to be a better way of proceeding. It may be the case that student preferences are inherently unstable. When the first choice institution in the eleventh grade portion of the student's record was compared with the twelth grade portion, there were substantial changes in the student's "preferences." At the very least, such variation suggests an important line of additional research.

In order to estimate the last four probabilities in Figure 1, six stepwise multivariate regression analyses in which the indpendent variables were entered in blocks were performed.[2] Within each initial preference category (public or private), three regression analyses were performed for three separate parental income levels; less than $10,000, $10,000-$20,000, and over $20,000. These separate analyses by income level allow for the investigation of possible interactions between selected independent variables and the level of parental income.

The dependent variable in each of these analyses was determined by whether or not the student matriculated at a public or a private institution. The dichotomous variable was coded "1" if the student matriculated at a public institution, and "0" otherwise.

As was indicated above, data was also available on other institutions within the student's choice set. The availability of this latter institutional data allows for the investigation of the role that differences between the college of matriculation and other colleges in the choice set play in the matriculation decision. These differences were assessed along six dimensions; tuition, distance from the student's home residence, college selectivity, and three financial aid variables.

The first variable was obtained from the Higher Education General Information Survey (HEGIS) for the 1972-73 academic year. This year was used for the pragmatic reason that it was the only data available at that time. Consequently, there is a discrepency between the year of matriculation and the year for which tuition data is available. Such a discrepency would not, however, alter the research findings due to the fact that tuitions at public and private institutions have grown at approximately the same rate between 1972-73 and 1975-76 academic years (Minter and Bowen, 1977).

College selectivity is an estimate of the average academic ability level of the entering freshman class (Astin and Henson, 1977). Astin and Lee (1972) have also shown that this variable is the single best indicator of college wealth or affluence. As such, it partially reflects the quality of the institution (Solmon, 1973). The distance variable is calculated between the student's home and college zip codes. Thus, it represents a distance measure "as the crow flies," not the actual travel distance.

Three financial aid variables were available; scholarships and grants, loans, and work-study. Students were asked in the 1975 ACE survey to report the amount of aid they received in each of these categories for their institution of matriculation, and the other institutions in their choice sets. Because of the confidentiality issues raised, it is not possible to verify these aid awards and offers. However, such self-reported data may be more informative in that it represents what the student believed the offer of assistance to be, rather than what it actually was. Further, because the ACE survey is usually conducted early in their freshman year and

for national and not (directly) institutional purposes, there is little reason to believe that students would be motivated to distort their reports. Nonetheless, a relatively complex editing procedure was developed to insure that the financial aid data was reasonable and internally consistent (Astin et al., 1978).

For each of the six institutional variables, a set of six difference scores were calculated. The procedure for calculating these difference scores was as follows. First, the institution of matriculation was taken as the point of reference. Consequently, all difference scores were between the institution of matriculation, and an institution of the oppostite control. Second, the method for calculating institutional differences was to identify the institution of opposite control in the choice set which had the largest tuition difference from the institution of matriculation. Differences for the remaining five institutional variables were then calculated in the same manner. Third, in each case, the difference calculated was public minus private.

In addition to these six institutional variables, twenty-one individual student characteristics were also included. Earlier research indicates that the same factors which influence a student's decision to go to college also influences his/her matriculation decision (Sewell and Shah, 1967; Wolfe, 1973). Thus a person's socio-economic status has been found to be positively associated with attending a private institution (Feldman and Newcomb, 1969). In the present study, socio-economic status was decomposed into three components; parental income, father's education and mother's

education. Parental income was reported by the student on the ACE survey. Because the questionnaire requested the student to provide his/her "best estimate" of parental income by checking one of fourteen categories, it was necessary to convert these categories into a continuous variable. This conversion was accomplished by assigning each student the midpoint value of the category checked. Parental education was measured by two dichotomous variables with 0 = less than a bachelor's degree and 1 = at least a bachelor's degree.

Similarly, the student's academic ability has been found to be positively associated with attending a private IHE (Trent and Medsker, 1968; Feldman and Newcomb, 1969). Academic ability was measured by the student's SAT composite score or by converting the composite ACT score to an SAT equivalent by an equal percentile procedure (Astin et al., 1978).

Despite the large influence attributed to socio-economic status and academic ability, a number of additional student characteristics have been found to be related to student college choice. For instance, white students are almost twice as likely to enroll in private institutions as are black students (Carroll et al., 1977). This variable was dichotomized with 1 = non-white and 0 = white. In addition, the variable of student academic aspirations has been found to be related to student choice of certain IHE (Radner and Miller, 1975). In this present study, academic aspirations were operationalized as a dichotomous variable with 0 = aspiring to no more than a bachelor's degree and 1 = aspiring to more than a bachelor's degree. Surprisingly, the sex of the student (1 = male and 0 = female) has not been found to be significantly related to matriculation at either a public or private institution even though males might expect relatively higher monetary

returns for certain types of colleges than females (Radner and Miller, 1975; Carroll et al., 1977).

Finally, fourteen reasons why the student decided to matriculate at that particular institution were included. These reasons were; my relatives wanted me to come here ("relatives"), I wanted to live away from home ("liveaway"), my teacher advised me ("teacher"), this college has a very good academic reputation ("acadrep"), I was offered financial assistance ("finasst"), someone who had been here before advised me to go ("other"), this college offers special education programs ("speced"), this college has low tuition ("lowtui"), my guidance counselor advised me ("guidcoun"), I wanted to live at home ("athome"), I could not get a job ("nojob"), a friend suggested attending ("friend"), a college representative recruited me ("colrep"), and it will help me get a better job ("bettjob"). Students were asked how important (not important, somewhat important, and very important) each of these reasons was. For each reason, a dichotomous variable with 1 = very important and 0 = either not or somewhat important was created.

Table 2 presents the results of these regression analyses. Examining

- Table 2 Here -

the coefficients of determination at the bottom of the table reveals that between 29 and 48 percent of the variation in this college choice decision can be explained by these individual, institutional, and financial aid variables. The varying size of these coefficients of determination indicate the behavior of students from lower income families is relatively more pedictable than those from middle income families and middle income students are more predictable than upper income students. This finding

TABLE II - VARIABLES ASSOCIATED TO THE STUDENTS' DECISION TO MATRICULATE AT A PUBLIC INSTITUTION OF HIGHER EDUCATION

Prefer Public

Independent Variables	Low Income (N=412) Coefficient	Standardized Coefficient	T-Ratio	Middle Income (N=1219) Coefficient	Standardized Coefficient	T-Ratio	Upper Income (N=1347) Coefficient	Standardized Coefficient	T-Ratio
Intercept	0.33129154		(2.36)	-0.40867375		(4.30)	0.26944799		(2.75)
Sex	-0.024000	-0.024071	(-0.63)	-0.011514	-0.011538	(-0.51)	0.033080	0.032917	(1.34)
Race	0.016000	0.014656	(0.31)	0.025671	0.015329	(0.67)	0.075604	0.036180	(1.50)
Income	0.000011	0.055776	(1.44)	0.000000	0.002577	(0.12)	-0.000004	-0.070688	(-2.75)*
Fathed	-0.090247	-0.068616	(-1.68)	-0.029652	-0.027327	(-1.15)	0.004583	0.004203	(0.16)
Mothed	0.004549	0.003054	(0.08)	-0.011245	-0.008962	(-0.38)	-0.038376	-0.038238	(-1.53)
Degree	0.047488	0.044076	(1.11)	-0.004698	-0.004477	(-0.20)	-0.082073	-0.075689	(-3.12)*
Ability	0.000111	0.048065	(0.94)	0.000010	0.003881	(0.15)	0.000207	0.072492	(2.68)*
Relative	0.015000	0.005854	(0.15)	-0.065641	-0.030611	(-1.39)	0.042240	0.022163	(0.94)
Liveaway	0.049350	0.038919	(0.96)	0.021993	0.016771	(0.76)	-0.052619	-0.045881	(-1.91)*
Teacher	-0.026200	-0.013987	(-0.36)	-0.066343	-0.031144	(-1.42)	-0.171363	-0.069154	(-2.90)*
Acadrsp	0.009400	0.008456	(0.21)	-0.034889	-0.032598	(-1.40)	-0.058112	-0.051053	(-2.03)*
Finasst	-0.145340	-0.146065	(-3.58)*	-0.179767	-0.174435	(-7.33)*	-0.144580	-0.098459	(-3.82)*
Other	0.016000	0.011421	(0.29)	0.054664	0.040496	(1.68)	-0.013060	-0.009332	(-0.37)
Speced	-0.047700	-0.044562	(-1.12)	-0.000888	-0.000801	(-0.04)	-0.051175	-0.046731	(-1.95)*
Lowtui	0.347300	0.290042	(7.09)*	0.403887	0.324916	(14.35)	0.418879	0.282551	(11.79)*
Guidcoun	-0.000670	-0.000635	(-0.02)	-0.016226	-0.015021	(-0.68)	0.015868	0.014054	(0.60)
Athome	0.026700	0.016521	(0.42)	0.011747	0.006372	(0.28)	-0.060279	-0.021680	(-0.91)
Nojob	-0.047700	-0.017861	(-0.45)	-0.184129	-0.039325	(-1.78)	0.259087	0.031534	(1.34)
Friend	-0.129000	-0.056083	(-1.39)	-0.019438	-0.008561	(-0.36)	-0.012168	-0.005181	(-0.21)
Colrep	-0.084000	-0.036519	(-0.96)	-0.111978	-0.035886	(-1.62)	-0.187020	-0.070765	(-2.93)*
Bettjob	-0.016000	-0.016177	(-0.41)	-0.039924	-0.039549	(-1.74)	-0.069921	-0.069405	(-2.80)*
R^2	28.3%			28.9%			18.3%		
Madiftui	-0.000036	-0.044057	(-0.96)	-0.000142	-0.162237	(-6.34)*	-0.000159	-0.178109	(-6.35)*
Madifdis	-0.000035	-0.025724	(-0.67)	0.000017	0.013934	(0.63)	-0.000003	-0.003262	-0.14
Madifsel	0.000151	0.047061	(1.15)	0.000516	0.138965	(5.75)*	0.000733	0.196870	(7.39)*
R^2	29.8%			32.6%			22.2%		
Madifgr	0.000120	0.359863	(8.09)*	0.000121	0.268957	(11.25)*	0.000108	0.168418	(6.75)*
Madiflo	0.000119	0.126529	(3.10)*	0.000164	0.210114	(9.24)*	0.000202	0.198670	(8.36)*
Madifwk	0.000266	0.188967	(4.30)*	0.000103	0.075087	(3.34)*	0.000049	0.018887	(0.80)
R^2	48.2%			44.5%			29.1%		
Probability									
Public		.569			.699			.191	
Private		.431			.301			.809	

*significant at $p \leq .05$

TABLE II - VARIABLES ASSOCIATED TO THE STUDENTS' DECISION TO MATRICULATE AT A PUBLIC INSTITUTION OF HIGHER EDUCATION

Prefer Private

	Low Income (N=482)			Middle Income (N=1371)			Upper Income (N=1613)		
Variables	Coefficient	Standardized Coefficient	T-Ratio	Coefficient	Standardized Coefficient	T-Ratio	Coefficient	Standardized Coefficient	T-Ratio
Intercept	0.20514957		(1.94)	0.18995321		(2.43)	0.40822989		(5.29)
Sex	-0.039189	-0.046550	-(1.29)	-0.018884	-0.021737	(-1.00)	-0.015230	-0.017032	(-0.75)
Race	0.041755	0.045461	(1.14)	0.021424	0.014549	(0.67)	-0.010763	-0.005346	(-0.25)
Income	0.000004	0.023398	(0.66)	-0.000002	-0.013182	(-0.62)	-0.000004	-0.104893	(-4.46)*
Fathed	0.003195	-0.003130	(-0.08)	-0.013280	-0.014306	(-0.63)	-0.019350	-0.019378	(-0.83)
Mothed	0.020630	0.017009	(0.46)	-0.006357	-0.006044	(-0.27)	0.018001	0.020235	(0.90)
Degree	-0.004970	-0.005529	(-0.15)	0.014298	0.015632	(0.73)	-0.009929	-0.009797	(-0.44)
Ability	-0.000003	-0.001619	(-0.04)	0.000107	0.045909	(1.86)	0.000007	0.002855	(0.11)
Relative	-0.029301	-0.015875	(-0.44)	-0.041904	-0.022613	(-1.10)	-0.034872	-0.019930	(-0.93)
Liveaway	0.060000	0.053804	(1.50)	-0.034808	-0.031912	(-1.49)	-0.021287	-0.021378	(-0.98)
Teacher	0.071426	0.043862	(1.23)	0.054429	0.028673	(1.35)	-0.077941	-0.032081	(-1.49)
Acadrep	-0.027273	-0.028283	(-0.76)	-0.127344	-0.131328	(-5.98)*	-0.097512	-0.091739	(-4.06)*
Finasst	-0.085738	-0.101843	(-2.78)*	-0.105283	-0.118762	(-5.22)*	-0.053078	-0.041501	(-1.74)
Other	-0.026498	-0.021706	(-0.56)	-0.034102	-0.027597	(-1.25)	-0.021294	-0.016741	(-0.73)
Speced	-0.046326	-0.049662	(-1.35)	-0.056624	-0.058992	(-2.80)*	-0.058752	-0.059798	(-2.74)*
Lowtui	0.466623	0.407839	(10.96)*	0.449324	0.358977	(16.69)*	0.593656	0.391112	(18.02)*
Guidcoun	0.008073	0.008844	(0.25)	-0.000703	-0.000730	(-0.04)	-0.007374	-0.007288	(-0.34)
Athome	-0.024399	-0.017843	(-0.49)	-0.094424	-0.062121	(-2.94)*	-0.034903	-0.013862	(-.063)
Nojob	-0.101066	-0.026874	(-0.75)	-0.040329	-0.009334	(-0.45)	-0.020390	-0.003415	(-0.16)
Friend	-0.069406	-0.033196	(-0.89)	-0.047121	-0.020913	(-0.95)	0.001181	0.000548	(0.02)
Colrep	0.008807	0.004408	(0.12)	-0.019180	-0.007696	(-0.37)	-0.077574	-0.026454	(-1.24)
Bettjob	-0.051902	-0.062117	(-1.68)	-0.020302	-0.023207	(-1.06)	-0.049556	-0.054954	(-2.51)*
R^2	30.6%			31.5%			24.0%		
Madiftui	-0.000118	-0.176749	(-4.19)*	-0.000150	-0.201551	(-8.25)*	-0.000103	-0.124700	(-4.99)*
Madifdis	-0.000049	-0.043749	(-1.24)	-0.000027	-0.023537	(-1.13)	0.000001	0.001024	(0.05)
Madifsel	0.000110	0.038918	(0.98)	0.000358	0.105804	(4.60)*	0.000362	0.103884	(4.42)*
R^2	31.3%			34.5%			25.8%		
Madifgr	0.000122	0.392184	(10.65)*	0.000095	0.241377	(10.33)*	0.000092	0.157399	(6.65)*
Madiflo	0.000068	0.099390	(2.72)*	0.000127	0.189661	(8.86)*	0.000111	0.140691	(6.48)*
Madifwk	0.000132	0.110990	(2.98)*	0.000106	0.071810	(3.34)*	0.000098	0.054944	(2.56)*
R^2	47.9%			44.1%			30.1%		
Probability									
Public		.603			.418			.265	
Private		.397			.582			.735	

*significant at p ≤ .05

implies that variables other than those included in these equations affects upper income students' decision to matriculate at a public or private institution. On the other hand, the behavior of lower income students can be predicted very well with these variables. Further, the decisions of all students are predominately a function of the three financial aid variables.

The last assertion can be substantiated by examining the coefficients of determination at each stage in the analysis. After including both the student and institutional characteristics, the coefficients of determination range from 18 to 31 percent. Adding the three financial aid variables increases these coefficients of determination so that they range from 29 to 48 percent. It is important to note that by entering the independent variables in blocks, these increments in the coefficients of determination are biased downwards because any joint contribution among the student institutional and financial aid variables has been attributed to the student and institutional variables since they were forced to enter the equation before the financial aid variables. Nonetheless, no less than 20 percent of the explained variation is attributable to the financial aid variables.

This conservative estimate of the impact of financial aid is even more remarkable due to the fact that student perceptions of the importance of financial assistance (and low tuition) had already been included in the regression equation. In the case of both low income groups and the middle income group initially preferring public institutions, these two student opinion variables were the only individual characteristics entering the model. These results demonstrate the efficacy of student financial assistance for targeted income groups.

In order to assess the relative importance of the various types of

financial aid, it is necessary to examine the degree of association between a particular aid variable and the dependent variable. Table 2 also displays the association of each independent variable with the dependent variable after the final step in the regression procedure. The standarized regression coefficient indicates the relative importance of each independent variable.

Insight into a student's college choice behavior is obtained by a careful examination of the standardized regression coefficients of the financial aid variables. From an economic perspective, the offer of financial assistance is intended to lower the monetary cost of attending the offering institution, thereby presenting the student with a "net price" that is lower than the institution's stated tuition. However, the same "net price" may have a differential impact on the student's matriculation decision, depending upon the type of financial aid offered. Further, the type of financial aid offered affects students at different income levels in different ways.

For low income students, financial aid in the form of direct grants and scholarships are relatively more important than the other two forms of aid. Such a result is not surprising in that students are essentially receiving a subsidy that does not require repayment of any type. Second in importance is college work-study. Unlike grants and scholarships, this type of aid does require immediate repayment in the form of student labor. However, this form of repayment is apparently considered less onerous by low income students that going into debt. Thus loan repayments, in which the student is expected to repay some or all of the award over a period of time starting shortly after graduation, is relatively less important to these students than other forms of aid.

Middle income students also find financial aid relatively more important

than the other two forms of aid, probably for the same reasons. However, middle income students invert the order of importance of loans and work-study indicated by low income students. Specifically, middle income students are more willing to acquire some debt rather than exchanging their labor for a reduction in the price of attending a particular institution. This finding suggests subtle differences in the value structures of low and middle income students.

Finally, high income students also reveal that college work-study is a relatively less important form of financial aid than scholarships and loans. In fact, work-study for these students who initially preferred public institutions is not statistically significant. Further, the order of relative importance of grants and loans is not consistent for students from high income families. It may be that some high income students perceive economic incentives in loan programs that are not generally understood by students from lower or middle income families. However, it is important to point out that financial aid for these students is generally of less importance to these students than to the students from lower and middle income families.

In terms of its relative importance, financial aid in the form of grants and scholarships is generally relatively more important to the student's in the final stage of the college choice process than the two institutional variables of tuition and college selectivity. This result indicates that increases in grants and scholarships would have a greater impact than lowering tuition. Further, lower income students do not appear to be affected by the selectivity of the college while students from middle and upper income levels are. This latter finding would indicate students from upper (and for those initially preferring a private institution), the academic quality and/or

reputation of the institution are important factors in the matriculation decision. This interpretation is further reinforced by the significant associations between the matriculation decision and student opinions concerning the importance of the college's academic reputation and the existence of special educational programs.

The only remaining individual characteristics that are associated with the student's matriculation decision occur in the upper income (and middle income initially preferring a public institution) groups. This association may be due to the increased variability in this group that results from the categorization of parental income into three levels. It may also represent a finding with substantial policy implications. Because tax allowances in their various forms are designed to supplement parental income, these results would indicate that such an approach to equality of choice is ineffective for students from lower and middle income groups, not to mention regressive.

While the preceding discussion presents the major results of this study, it may be helpful to examine in detail one of these analyses. Such an examination will hopefully avoid confusion over the interpretation of coefficients in Table 2 and also indicate how these results may be used in completing Figure 1. The results of the analysis for lower income students who initially preferred public institutions has been selected for this purpose.

The probability that a student from a lower income family matriculates at a public institution can be expressed in the following model:

Prob (matriculating at a public institution) =

.331 - .024 (Sex) + .016 (Race) +

.000011 (Income) - .09 (Fathed) + (2)

.0045 (Mothed) + .047 (Degree) +

.000111 (Ability) - .145 (Finasst) +

.347 (Lowtui) - .000036 (Madiftui) -

.000035 (Madifdis) + .000151 (Madifsel) +

.00012 (Madifgr) + .000119 (Madiflo) +

.000266 (Madifwk).

In this model, the values of the continuous variables on set equal to the average values for that variable in this analysis subsample (see Appendix A). The values of the discrete, student characteristic variables were set so that sex equals male, race equals white, father's and mother's education equals at least a bachelor's degree, and the student initially aspired to some graduate degree. The two student opinion variables, the importance of financial assistance and low tuition which were statistically significant, are also included.

However, the probability that a student selects a public institution is primarily a function of five variables; differences in grant, loan, and work-study offers, and student opinions, the importance of low tuitions and financial assistance. The positive association of differences in financial aid offers and the probability of matriculating at a public institution means that as a private institution offers more financial aid relative to a public institution, the probability that the student will matriculate at a public institution declines. A simple rule for interpreting the coefficients

on the difference-score variables is as follows: if the coefficient is negative and the average value for that variable is positive (or vice versa), then the probability that the student matriculates at a public institution decreases because a negative times a positive equals a negative (i.e. decreases the probability of matriculating at a public institution). However, if the coefficient and the average value are both positive or both negative, then the probability of matriculating at a public institution increases for similar reasons. The associations between the probability of matriculating at a private institution and the remaining difference-score variables may be interpreted in a similar manner.

The probability that such a student matriculates at a public institution is negatively associated with the importance the student attaches to financial assistance. As the importance of financial assistance increases, the probability of matriculating at a private institution increases. On the other hand, the positive coefficient for the importance of low tuition indicates that as the student perceives this variable as more important, the probability of matriculating at a public institution increases.

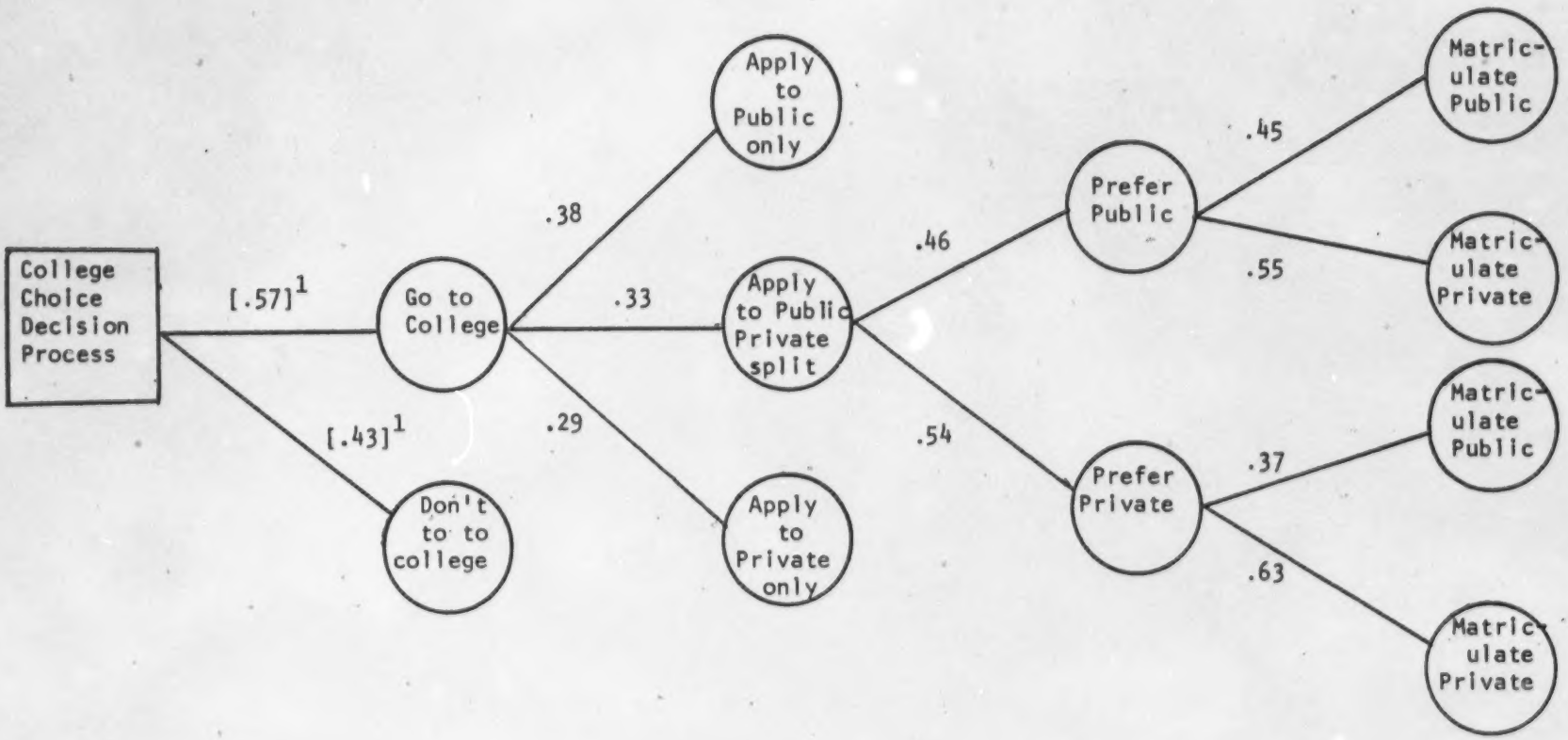
Employing the more general model (2) and the values of the variables indicated above, it is possible to estimate the probability that a student will matriculate at a public or private institution. For low income students initially preferring public institutions (equation 2 above), the estimated probability is .569. The probability for matriculating at a private institution is, by simple subtraction, .431. Following a similar procedure, probabilities for the remaining analysis subsamples are displayed at the bottom of Table 2.

From these probabilities, it is possible to complete Figure 1. Figure 2

- Figure 2 Here -

Figure 2

Student College Choice
Decision Process



[1] Estimates developed by Carroll et. al., 1977.

displays the same decision process as Figure 1, only with all the branches completed. (These probabilities are based upon weighted estimates across all three income levels.) Making the probabilities at the matriculation stage a function of the independent variables substantially broadens the ability of researchers to examine the likely policy implications, in terms of the probability that a student will attend a public or private institution. Of particular interest for the remainder of this paper is the impact of changes in the grants and scholarships on the probability of matriculating at a private institution.

Public Policy Implications

The preceding analysis of student demand functions indicates that financial assistance is a powerful mechanism for increasing competition between public and private institutions. Not only does the offer of financial assistance lower the net price of the offering institution, but the student's decision to matriculate is substantially affected by such an aid offer. Although this last assertion is particularly appropriate for low and middle income students, it is still applicable to students from families earning over $20,000 a year (in 1975 dollars). Assuming that a student equates the benefits of attending any given institution at the application stage in the college choice process, lowering the net price of any given institution within the student's choice set increases the net present value of the offering institution and thereby increases the probability that a student will matriculate at that institution.

Of the three forms of financial assistance studies, direct grants and scholarships appear to be the most effecitve. In general, grants and scholarships are more effective than lowering tuition, especially for students

from low income faimilies. Further, this form of aid is generally more effective than other forms of financial assistance which requires some form of repayment. This latter finding tends to reinforce the economic interpretation of financial assistance which argues that students appear to calculate the present value of various forms of financial aid. To the student, a dollar of financial aid in the form of a direct grant or scholarship is not the same as a dollar of assistance in the form of a loan or work-study.

To the taxpayer, a dollar of grant aid is also not the same as a dollar of either loan or work-study financial assistance (Johnstone 1977). These differences in the cost to the taxpayer emphasize the necessity of examining the relative efficiencies of the various forms of financial aid before it is possible to recommend courses of action that attempt to increase the proportion of students with this choice set who matriculate in either public or private institutions. However, due to the difficulties in estimating the cost to the taxpayer of loans and to some extent work-study, the present study will confine itself to the cost of direct grants to students. In this case, the cost to the taxpayer is equal to the total amount of basic grants appropriated.

The data in Table 2 allows for an estimate of the marginal costs of direct grants for each of the six analyses subsamples.[3] These marginal costs are $3660 for students from low income families who initially preferred public institution, $2547 for students from middle income families, and $7360 for students from upper income families. For students initially preferring private institutions, these marginal costs are $3283, $6238, and $8000 for lower, middle, and upper income groups, respectively. The rising marginal costs, especailly for students from upper income families, is due to both the fact that this form of aid is relatively less effective for this group of students

and to the relatively high proportion of students in this income group who are already matriculating in the private sector. As the proportion of students matriculating in the private sector increases, it becomes increasingly more difficult (and expensive) to induce an additional student to matriculate at a private rather than a public institution.

It is now possible to combine these marginal cost estimates with the probabilities calculated at the bottom of Table 2. As was indicated in the second section of the paper, the core element in this combination is a Markov transition matrix. Table 3 displays the complete set of transition probabilities for this study. It should be noted that the row marginal

- Table 3 Here -

frequencies are based upon weighted estimates of the total population of freshmen entering U. S. Colleges and Universities in 1975. In that year, the total number of first time students at all institutions was 475,692. (Chronicle, 1977).

Under the 1975 set of incentives, 20,469 students (58 percent) with this choice set matriculated in private institutions. Of the 20,469 who matriculated in private institutions, 13,902 (68 percent) came from upper income families. More importantly, this group of 13,902 students can be divided betweeen the 7080 who initially preferred a public institution and the 6822 who initially preferred private institutions. For any particular income level, students who matriculate at a private institution are drawn from two groups; those who initially preferred and eventually matriculated at a private institution, and those who initially preferred a public institution but switched to a private institution when the matriculation decision had to be made.

TABLE III

Weighted Transition Matrix

Initial Preferences		Matriculated: Low Income Public	Low Income Private	Middle Income Public	Middle Income Private	Upper Income Public	Upper Income Private	Total Preferring
Low Income	Public	.569	.431					3025
	Private	.603	.397					2976
Middle Income	Public			.699	.301			8970
	Private			.418	.582			2374
Upper Income	Public					.191	.809	8751
	Private					.265	.735	9281
	Total	3516		7262		4130		
	Matriculating		2485		4082		13902	35377

What would be the additional cost if the federal government sought to increase the proportion of students with this choice set who matriculate at a private institution by one percentage point? The least cost alternative would be to increase the number of students from middle income families who initially preferred a public institution to switch to a private institution. As an increase of one percentage point would require approximately 350 more students to switch the additional cost would be $891,450 (350 x$2547). Thus, the basic trade-off between private matriculants and federal expenditures appears to be approximately $900,000 for each additional percentage point. (This rule-of-thumb would probably hold until 50 percent of these students were switching to private institutions, at which point the marginal cost would probably increase significantly.) In 1975, the federal government appropriated $715,000,000 for its basic opportunity grant program. To achieve a one percentage point increase in private matriculants would have required a 12.5 percent increase in this appropriation.

It is interesting to note that by broadening student eligibility for financial aid, the federal government has probably increased the number of middle income students who will matriculate at a private institution. It is not the case that these students are being forced out of an opportunity for postsecondary education by the rising price of attending, but that they are forced to consider other options than was the case formerly. Further, the data in Table 2 would indicate that increasing student eligibility for financial aid is more effective than some form of income supplementation (e.g. tuition tax credits) in increasing equality of choice.

The data presented in this study clearly indicates that "every student has his/her price." However, it is important to recall that only 6.5 percent

of the analysis sample met the criteria that a student apply and be admitted to at least one public and one private institution. This result indicates that relatively few students are actually involved in direct public/private competition at the final stage in the college choice process. This result suggests that getting students to consider a private institution in the first place is more critical for the college choice process then trying to induce a few additional students to matriculate in a private rather than a public institution. The corollary to "every student has his/her price" is "what can be done to get students to consider the deal in the first place?"

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Footnotes

[1]The creation of this data set was accomplished under an Office of Education grant by the Higher Education Research Institute under the direction of Alexander W. Astin.

[2]All analyses employed the Statistical Analysis System (SAS) regression procedure. These analyses were conducted on The Pennsylvania State University's IBM 3330.

[3]For instance, there are currently 412 students in the low income sample. Using equation (2), it is possible to predict that 178 students (412 * .431) will matriculate in private institutions under the current (average) distribution of grants and scholarships. If each private institution offered an additional $100 grant or scholarship to these students, it would be expected that the probability that a student would matriculate in a private institution would increase to .443 (.431 + 100 (.00012)). Skimming over the entire sample, there would now be 183 matriculants in private institutions, or an increase of 5 students. The additional cost of this $100 increase in grants or scholarships would be $18,3000 (183 * $100), or $3660 per additional student.

APPENDIX A

SUMMARY CHARACTERISTICS OF STUDENT ATTRIBUTES AND INSTITUTIONAL DIFFERENCES

(Prefer Public)

Independent Variable	Lower Income N=412		Middle Income N=1219		Upper Income N=1347	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Sex	0.43932039	0.49690774	0.49220673	0.50014445	0.55308092	0.49735908
Race	0.28883495	0.45377208	0.09844135	0.29893274	0.06087602	0.23919157
Inco	6236.65048544	2451.81127628	14813.37161608	2624.37607608	32449.88864143	9952.63177554
Fathed	0.16990291	0.37600408	0.30352748	0.45996969	0.70007424	0.45839535
Mothed	0.12621359	0.33249369	0.19688269	0.39780613	0.45360059	0.49802734
Degree	0.69902913	0.45923774	0.65463495	0.47568231	0.69413512	0.46094391
Ability	959.34466019	214.14302164	1023.06808860	186.27038046	1078.39643653	174.93139454
Relative	0.03883495	0.19343634	0.05742412	0.23274670	0.07423905	0.26225689
Liveaway	0.18689320	0.39029973	0.17555373	0.38059618	0.25463994	0.43582043
Teacher	0.07524272	0.26410329	0.05824446	0.23430126	0.04231626	0.20138446
Acadrep	0.72815534	0.44545119	0.68088597	0.46632463	0.73942094	0.43911361
Finasst	0.55097087	0.49799992	0.37489746	0.48429512	0.13363029	0.34038103
Other	0.14563107	0.35316482	0.16324856	0.36974399	0.14996288	0.35716764
Speced	0.30825243	0.46233287	0.28137818	0.44985610	0.29547142	0.45642383
Lowtui	0.21844660	0.41369443	0.20180476	0.40151195	0.13066073	0.33715411
Guidcoun	1.32524272	0.46903503	1.30844955	0.46204281	1.26726058	0.44269386
Athome	0.10436893	0.30611026	0.07957342	0.27074273	0.03340757	0.17976512
Nojob	0.03398058	0.18139948	0.01148482	0.10659382	0.00371195	0.06083520
Friend	0.04854369	0.21517337	0.05086136	0.21980473	0.04751299	0.21281243
Colrept	0.04954369	0.21517337	0.02625103	0.15994654	0.03711952	0.18912488
Bettjob	0.50000000	0.50060790	0.42411813	0.49441123	0.43652561	0.49613884
Madiftui	-1466.04368932	612.70262295	-1516.19360131	569.22507915	-1687.62435041	560.03767513
Madifdis	-62.04854369	364.29869642	-30.01066448	409.08784639	-65.00296956	503.26266113
Madifsel	-20.29126214	154.40463358	-16.94831829	134.48389379	-24.83296214	134.31582566
Madifgr	-665.86407767	1477.00320023	-495.96390484	1105.37295878	-206.66221232	777.14181503
Madiflo	-202.81310680	524.0159694	-209.91468417	637.68865339	-69.25612472	490.61666978
Madifwk	-92.45631068	351.7530961	-58.28958162	362.75452621	-20.93912398	192.77139069

APPENDIX A

SUMMARY CHARACTERISTICS OF STUDENT ATTRIBUTES AND INSTITUTIONAL DIFFERENCES

(Prefer Private)

Independent Variable	Lower Income N=482		Middle Income N=1371		Upper Income N=1613	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Sex	0.43153527	0.49580499	0.49817651	0.50017912	0.55114693	0.49753136
Race	0.29045643	0.45444467	0.09628009	0.29598260	0.05145691	0.22099633
Inco	6244.81327801	2536.67978897	14880.56163384		33243.95536268	0439.91295981
Fathed	0.21161820	0.40887996	0.32385120	0.46811477	0.72721637	0.44552866
Mothed	0.13692946	0.34413003	0.21808899	0.41309884	0.49287043	0.50010421
Degree	0.68672199	0.46430826	0.65645514	0.47506463	0.73961562	0.43898044
Ability	973.19502075	210.48345335	1053.48650620	186.12674141	1100.37817731	187.03456593
Relative	0.05394191	0.22613774	0.05835157	0.23449258	0.06943583	0.25427265
Liveaway	0.16804979	0.37429898	0.19766594	0.39838408	0.27526348	0.44678547
Teacher	0.07053942	0.25631995	0.05543399	0.22890890	0.03471792	0.18312120
Acadrep	0.75103734	0.43286139	0.72210066	0.44812696	0.77371358	0.41855643
Finasst	0.56846473	0.49580499	0.40043764	0.49016587	0.14073156	0.34785227
Other	0.13485477	0.34192326	0.14442015	0.35164350	0.14259144	0.34976416
Speced	0.27593361	0.44744790	0.28738147	0.45270614	0.28766274	0.45281343
Lowtui	0.15767635	0.36481590	0.14004376	0.34715906	0.09485431	0.29310447
Guidcoun	1.29668050	0.45726905	1.28446389	0.45132334	1.26162430	0.43965539
Athome	0.10373444	0.30523253	0.08971554	0.28587807	0.03223807	0.17668652
Nojob	0.01244813	0.11098979	0.01021152	0.10057150	0.00557967	0.07451157
Friend	0.04149378	0.19963649	0.03865791	0.19284866	0.04463732	0.20657029
Colrep	0.04564315	0.20892682	0.03136397	0.17436297	0.02355859	0.15171635
Bettjob	0.46887967	0.49954906	0.44128373	0.49672162	0.41785493	0.49335899
Madiftui	-1503.48547718	623.83653771	-1608.55579869	584.88088530	-1776.59640422	540.72211520
Madifdis	-31.81327801	372.28828052	-60.89788475	375.18814521	-78.47613143	479.43721164
Madifsel	-42.63485477	147.76895022	-54.72647702	128.45452042	-65.22008679	127.70703249
Madifgr	-946.82157676	1337.06758192	-734.64186725	1099.43082260	-271.68877867	760.98413971
Madiflo	-296.10165975	612.96290415	-288.95915390	646.99146516	-131.06261624	562.48005351
Madifwk	-121.55601660	350.80399189	-98.41867250	294.56829687	-26.24612523	250.19501735